REMARKS

Claims 1 to 20 are all the claims pending in the application, prior to the present Amendment.

Claims 1, 4-12 and 17 have been rejected under 35 U.S.C. 103(a) as being unpatentable over JP 2000-265232 to Kamio et al in view of JP 64-039339 to Sakamoto et al and the newly cited US 2004/0261615 Yanagimoto et al.

Applicant submits that Kamio et al, Sakamoto et al and Yanagimoto et al do not disclose or render obvious the subject matter of the presently claimed invention and, accordingly, requests withdrawal of this rejection.

The present invention as set forth in claim 1 as amended above is directed to a method for producing an aluminum-alloy shaped product, comprising a step of forging a continuously cast rod of aluminum alloy serving as a forging material, in which the aluminum alloy contains Si in an amount of 10.5 to 13.5 mass%, Fe in an amount of 0.15 to 0.65 mass%, Cu in an amount of 2.5 to 5.5 mass% and Mg in an amount of 0.3 to 1.5 mass%.

The aluminum alloy also contains Ni in an amount of 0.8 to 3 mass% and P in an amount of 0.003 to 0.02 mass%, and at least one or a combination of two or more of Mn in an amount of 0.1 to 1.0 mass%, Zr in an amount of 0.04 to 0.3 mass%, V in an amount of 0.01 to 0.15 mass% and Ti in an amount of 0.01 to 0.2 mass%, at least, the aluminum alloy containing Cr in an amount suppressed to not more than 0.5 mass%, Na in an amount suppressed to not more than 0.015 mass%, Ca in an amount suppressed to not more than 0.02 mass% and the balance comprising aluminum and an inevitable impurity.

The aluminum alloy is subject to heat treatment and heating steps, wherein the heat treatment and heating steps include a step of subjecting the forging material to pre-heat

treatment, a step of heating the forging material during a course of forging of the forging material and a step of subjecting a shaped product to post-heat treatment, wherein the pre-heat treatment including treatment of maintaining the forging material at a temperature of 200 to 470°C for two to six hours.

Thus, applicant has amended claim 1 to include recitations from claims 6, 7 and 10. Applicants have canceled claims 6, 7, 10 and 17 to 19.

Claim 1 as amended requires the presence of both Ni and P, and further requires at least one or a combination of two or more of Mn in an amount of 0.1 to 1.0 mass%, Zr in an amount of 0.04 to 0.3 mass%, V in an amount of 0.01 to 0.15 mass% and Ti in an amount of 0.01 to 0.2 mass%.

Examples 5 to 10, 12, and 16 to 23 in Tables 1 and 2 of the original specification as well as new Examples 7-2, 7-4, and 7-6 in Appendix Tables 1 to 3 attached to the Amendment under 37 C.F.R. 1.111 filed on December 28, 2009 in response to the previous Office Action are encompassed by the technical scope of the amended claim 1.

Kamio, Sakamoto et al and Yanagimoto et al do not disclose or suggest an aluminum alloy containing both Ni and P as components of the alloy, and do not disclose or suggest the use of the temperature range recited in claim 1 for such an alloy.

The Examiner has previously stated that Kamio et al teach a process of producing an aluminum-alloy shaped product after continuous casting the aluminum alloy comprising a preheat treatment at a temperature of 490-510 °C for 3 to 5 hours. The Examiner referred to claim 2 of Kamio et al as disclosing this temperature range. The Examiner stated that even though the claimed preheat temperature range and the range disclosed by Kamio et al do not

overlap, a prima facie case still exists where the claimed range and the range disclosed by the prior art are close enough that one skilled in the art would have expected the same result.

In response, although the Examiner has argued that a prima facie case of obviousness still exists where the claimed range and the range disclosed by the prior art are close enough that one skilled in the art would have expected the same result, applicant submits that the present specification contains evidence that the same results are not achieved and that the present invention achieves unexpected results.

Thus, Comparative Example 1 and Comparative Example 1-1 of the present specification each employed a preheat temperature of 490°C, which is within the 490-510°C range disclosed by Kamio et al. As can be seen from Table 2 of the present specification, Comparative Example 1 and Comparative Example 1-1 did not achieve the results of the Examples of the present invention which employed a preheat temperature within the range of the present claims. For example, Comparative Example 1 and Comparative Example 1-1 had a lower fatigue strength at 300°C and worse tensile characteristics at 300°C than any of the Examples of the present invention.

In addition, applicant refers the Examiner to Appendix Tables 1-3 that were attached to the Amendment under 37 C.F.R. 1.111 filed on December 28, 2009, which contain data from the present specification and which contain data for Examples 7-1 to 7-6 that had been added to the Tables.

Appendix Tables 1-3 show the following facts about the effects depending on the temperature of the pre-heat treatment (homogenization treatment).

- Based on a comparison between Comparative Examples 1 and 1-1 and Examples 5 to 8, it can be seen that the homogenization treatment at a temperature of 470°C or less leads to

the production of a product having higher strength than obtained at a temperature of 490°C, which is the minimum temperature disclosed in Kamio et al for the pre-heat treatment (homogenization treatment).

- Further, based on a comparison among Examples 16 to 19 of the present specification, it can be seen that the lower the temperature for homogenization treatment is, the higher the high-temperature tensile strength and high-temperature fatigue strength are, and that a similar tendency is found among Examples 20, 21 and 23.

- Still further, based on a comparison among Examples 7, 7-1 to 7-3 and 7-5, it can be seen that the closer to room temperature the temperature for homogenization treatment is, the higher the high-temperature tensile strength is.

The advantageous effects depending on the temperature of the pre-heat treatment (homogenization treatment) for the alloy of the present invention which are described above are neither disclosed nor suggested in any of Kamio et al (JP2000265232) and Sakamoto et al (JP64039339).

Accordingly, applicant submits that the present invention achieves unexpected results as compared to Kamio et al and, therefore, is patentable over Kamio et al, Sakamoto et al and Yanagimoto et al.

The Examiner does not provide any specific comments on the arguments that applicant submitted with respect to unexpected results.

The Examiner recognizes that Kamio et al in view of Sakamoto et al do not expressly teach the claimed preheating (homogenizing) temperature.

The Examiner states, however, that it is well held that discovering an optimum value of a result effective variable requires only routine skill in the art. The Examiner states that in the

present case, the pre-heating (homogenizing) temperature is a result effective variable since it affects the forgeability of the forging material and the uniformity of mechanical characteristics of the forged aluminum alloy product, as evidenced by paragraph [0082] of the newly cited Yanagimoto et al publication.

The Examiner states that one of ordinary skill in the art, therefore, would have optimized the pre-heating (homogenizing) temperature in the process of Kamio et al in view of Sakamoto et al in order to achieve desired forgeability of the forging material and the uniformity of mechanical characteristics of the forged aluminum alloy product.

In response, applicant submits that while one of ordinary skill in the art may have been led to optimizing within the range disclosed by Kamio et al, one would not have been led to optimizing outside of that range.

Further, Yanagimoto et al disclose in paragraph [0082] that the homogenizing can be performed at a temperature of 400°C up to the difference obtained by deducting 10°C from the solidus temperature of the alloy. In the Examples of Yanagimoto et al, a temperature of 490°C was employed for the homogenization. This is the same temperature that is at the lower end of the range of Kamio et al and is the same temperature that was employed in Comparative Example 1 and Comparative Example 1-1 of the present specification, and which did not achieve the results of the present invention. Accordingly, applicants submit that the present specification provides evidence of unexpected results with respect to the claimed temperature.

The Examiner has previously stated that Kamio et al do not expressly teach a continuously cast rod of aluminum alloy with the claimed composition. The Examiner relied on Sakamoto et al as disclosing a continuously cast rod of an aluminum alloy, which is suitable for forging, with a composition relative to that of the claimed invention, in weight percent, which

overlaps the composition of the present claims as shown in a table that the Examiner had prepared.

The Examiner argued that it would have been obvious to one of ordinary skill in the art to use the aluminum alloy cast rod of Sakamoto et al in the process of Kamio et al since Sakamoto et al teach that such an aluminum alloy exhibit excellent wear resistance and forgebility by casting and heat-treating (abstract).

In addition, the Examiner stated that the amounts of Si, Fe, Cu, Mg, Ni, Sr, Mn and Al disclosed by Kamio et al in view of Sakamoto et al overlap the claimed amounts of Si, Fe, Cu, Mg, Ni, Sr, Mn and Al of the instant invention, which is prima facie evidence of obviousness The Examiner argued that it would have been obvious to one of ordinary skill in the art to have selected claimed amounts of Si, Fe, Cu, Mg, Ni, Sr, Mn and Al from the amounts disclosed by Kamio et al in view of Sakamoto et al because Sakamoto et al disclose the same utility throughout the disclosed ranges.

Kamio et al neither disclose nor suggest an aluminum alloy containing Ni. However, the present specification discloses that an aluminum alloy containing P and Ni within the ranges of the composition specified in claim 1 of the present application can be used to produce an aluminum shaped product having excellent high-temperature tensile strength, according to the present invention, as in Examples 5 to 10 shown in Table 1.

Thus, Kamio et al do not render obvious claim 1 directed to an aluminum alloy containing containing Ni and P.

Accordingly, Kamio et al do not suggest the composition of the aluminum alloy within the scope of claim 1 of the present.

The Examiner has relied on Sakamoto et al for a disclosure of various components and amounts of an aluminum alloy and argues that it would have been obvious to modify Kamio et al in view of the Sakamoto et al disclosure.

Applicant submits that one of ordinary skill in the art would not have been led to combining the teachings of Kamio et al and Sakamoto et al, and that even if the teachings were combined, one of ordinary skill in the art would not been led to present invention.

Thus, Kamio et al do not disclose the conditions for cooling a molten aluminum alloy when continuously casting the molten alloy.

On the other hand, the invention disclosed in Sakamoto et al requires that the casting temperature range from 670 to 850°C, and the cooling treatment be performed at a cooling speed of 5°C/sec. or higher within the temperature range of from 670 to 554°C and at a cooling speed of 10°C/sec. or higher within the temperature range of from 560 to 554°C (claim 2).

Further, the aluminum alloy used in the invention of Sakamoto et al contains Sr in an amount of 0.005 to 0.1 wt% as an essential component (claim 1), but Sakamoto et al nowhere disclose an aluminum alloy containing P.

On the other hand, while the invention disclosed in Kamio et al indispensably requires an aluminum alloy containing P as stated above, Sakamoto et al do not disclose an aluminum alloy containing P.

Accordingly, one of ordinary skill in the art would not have been led to combining the teachings of Kamio et al and Sakamoto et al.

With respect to the presence of Ni, Sakamoto et al disclose the use of Ni at page 6 of the translation as an optional component in an aluminum alloy that does not contain P, but Sakamoto et al do not contain any working Example of an alloy containing Ni. Thus, in the invention

disclosed in Sakamoto at al, Sr is essential while Ni is not essential. In contrast, claim 1 of the present application contains Ni as an essential component.

Since Sakamoto et al do not disclose any inventive example composed of an aluminum alloy containing Ni, it cannot specifically be known from Sakamoto et al how much the addition of Ni to the aluminum alloy composition can increase the strength of a product made of the alloy.

Accordingly, applicant submits that the composition of an aluminum alloy within the scope of claim 1 of the present application and containing Ni and P would not have been not obvious to those skilled in the art from Kamio et al or Sakamoto et al.

In addition, as discussed above, while the aluminum alloy disclosed in Sakamoto et al must be cooled at a predetermined cooling speed as stated above, Kamio et al do not disclose the conditions for cooling a molten alloy. Further, the production method disclosed in Kamio et al is an invention indispensably requiring the use of an aluminum alloy containing P.

Accordingly, it is anticipated that even if the aluminum alloy disclosed in Sakamoto et al is applied to the production method disclosed in Kamio et al, no product having a preferable given strength can be obtained.

Physical properties of an alloy can be completely different depending on the composition and the temperature of heat treatment. In fact, the Examples disclosed in Sakamoto et al, Kamio et al, and Yanagimoto et al as well as Comparative Examples 1 and 1-1 and Examples 1 to 23 of the present specification have different properties.

The Examiner has asserted that applicant has argued against the references individually, and that one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. Applicant points out, however, that applicant has argued, for a number of reasons, that one of ordinary skill in the art would not have been led

to combining the teachings of Kamio et al with those of Sakamoto et al, and that even if combined, the combined disclosure would not have produced the present invention.

The Examiner has not addressed the specific arguments as to why one would not have been led to combining these references.

In view of the above, applicant submits that the present invention was not obvious to one of ordinary skill in the art from the disclosures of Kamio et al, Sakamoto et al and Yanagimoto et al and, accordingly, requests withdrawal of this rejection.

Claims 13 and 20 have been rejected under 35 U.S.C. 103(a) as being unpatentable over Kamio et al (JP 2000265232) in view of Sakamoto et al (JP 64039339) and Yanagimoto et al (US 2004/0261615) as applied to claim 1 above, and further in view of Evans et al (US 7267734).

Claims 13 and 20 depend from claim 1. Accordingly, applicant submits that these claims are patentable for the same reasons as set forth above for claim 1.

Claims 18-19 have been rejected under 35 U.S.C. 103(a) as being unpatentable over Kamio et al (JP 2000265232) in view of Sakamoto et al (JP 64039339) and Yanagimoto et al (US 20040261615) as applied to claim 1 above, and further in view of Sato et al (US 6702907).

Applicant has canceled claims 18 and 19.

Accordingly, this rejection is moot and applicant therefore requests its withdrawal.

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

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Respectfully submitted,

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